

**No: 9/87**

**Ref: 1c**

**Aircraft type and registration:** Replica Supermarine S5 G-BDFF

**No & Type of engines:** 1 Rolls Royce Continental IO-360-A piston engine

**Year of Manufacture:**

**Date and time (UTC):** 23 May 1987 at 1145 hrs

**Location:** Near Mylor, Cornwall

**Type of flight:** Private

**Persons on board:** Crew — 1                      Passengers — None

**Injuries:** Crew — 1 (fatal)                      Passengers — N/A

**Nature of damage:** Aircraft destroyed

**Commander's Licence:** Private Pilot's Licence and Royal Aero Club Competitor's Licence

**Commander's Age:** 58 years

**Commander's Total Flying Experience:** 1062 hours (of which 22 were on type) and 175 hours in gliders

**Information Source:** AIB Field Investigation

### **Background**

G-BDFF was a full-scale dimensional replica of the Supermarine S5 aircraft, two of which represented Great Britain in the Schneider Trophy Competition of 1927. The replica was designed to represent accurately the outline of the Supermarine S5 and, in place of the original's duralumin, the floats and fuselage of the replica were constructed of spruce and plywood. G-BDFF was completed in 1975 and first flew in August of that year.

In 1980 the aircraft was damaged in an accident at Thorpe Park and, at a later date, the salvage was purchased and reconstruction commenced under the supervision of the Civil Aviation Authority. The extent of the damage was such that a new set of wings and floats were constructed and a new engine and propeller fitted: It was considered that the fuselage had not suffered major damage and could, with minor repairs, be restored to use.

The aircraft flew again on 5th October 1986 and by 23rd October had accumulated 39 hours, including a limited flight-test programme as part of the requirement for the issue of a full CAA Permit to Fly. The aircraft was then laid-up under cover, with a number of approved minor modifications being incorporated during the winter months by the owner.

### **History of the flight**

A week before the last flight the aircraft was taken down to St Just Creek and parked on its trailer beyond the boat house and above the high water mark.

The accident occurred on the first flight since October 1986, when the aircraft had been flown successfully from the same area of the Carrick Roads. The aircraft was towed out to its usual take-off point and a normal take-off was made. It was seen to fly north and follow the usual

circuit pattern by flying towards Restranguet Point before turning south to head towards Penarrow Point. The aircraft was observed to be flying straight and level at a normal circuit speed at a height estimated to be between 500 and 1000 feet.

As the aircraft was crossing above the end of the Mylor yacht moorings, witnesses saw the tail 'vibrating' or 'fluttering' just before the fin and rudder were seen to break off. The aircraft was seen to yaw left onto an easterly heading, slow down and slightly pitch up before losing its tailplane, tumbling over and crashing on the land close to Penarrow Point.

The weather conditions at the time were fine and sunny with a strong breeze blowing from the east. The aircraft was operating under a valid CAA Permit to Fly for 'Flight Testing' for the re-issue of a Permit to Fly.

### **Examination of the wreckage**

G-BDFF had come to rest inverted, with the engine stopped and structurally complete except for the fin, rudder, tailplane, elevators and fuselage tail-bullet. These pieces were recovered from the local area and, on reconstruction, it became apparent that the tailplane, with elevators still attached, had separated from the aft fuselage by rolling to the right, and that this could only have occurred after the failure and separation of the fin and rudder.

Examination of the rudder, which had remained attached only to the aft spar of the fin, showed considerable evidence on the hinge cover-plates of severe over-travel of the rudder, both to the left and to the right. These marks corresponded to heavy marking lower on the aft spar of the fin, caused by successive impacts of a pair of bolts mounted at the bottom hinge. It appeared that this oscillation had caused the aft spar to separate from the rest of the fin, resulting in the failure of the fin and subsequent failure of the tailplane. The junctions between the horizontal ribs and the aft spar of the fin had generally failed along the glue lines, with only small amounts of glue apparent within the joints themselves.

The centre-of-gravity of the rudder was measured as 29% of the rudder chord aft of the hinge line. As a guide, Chapter K3-9 ("Flutter Prevention and Structural Stiffness") of the British Civil Airworthiness Requirements cites a maximum of 15% of the rudder chord for aircraft with a Design Diving Speed under 130 kts EAS, and 5% over 130 kts EAS. The weight of the rudder was 11 lbs.

Although there was some evidence in the aft fuselage both of pre-existing impact damage and of excessive moisture in the structure, it was not possible to determine conclusively why flutter had occurred on the accident flight, and not previously.